

Fading Fluids

By:
Verissa Westley



Mrs. Salter's Class
#514
10/18/17

Scientific Question: Which liquid evaporates the quickest; water, milk, or apple juice?

Research

Question #1: Does milk evaporate like water?

Information: Milk is composed of two parts, a clear-like liquid, and a white yogurt-like solid. Leaving milk out for as long as I did in this experiment, I can take a good guess at how yogurt is made. What happens to milk when left out is, it spoils. The liquid separates from the solid. On bottom, taking up most of the mass is a solid white, cream/yogurt looking thing. Sitting on top of this solid is a clear tinted liquid unlike water, almost like oil. This oil-liquid *can* evaporate although the yogurt-solid cannot. So for a time, milk and water may evaporate at the same pace, but afterwards the milk will stop evaporating for there is nothing left to evaporate. Milk is made mainly of water, fat, protein, lactose, and minerals. There is some water in milk so milk can evaporate, but water does so to the last drop.

Answer: Milk does not evaporate like water.

Question #2: Do some elements evaporate faster than others? If so, which ones?

Information: The speed of a liquid evaporating depends on how heavy the molecules in the liquid are. Water is a lighter liquid. So is vegetable oil. Honey and corn syrup on the other hand are dense liquids and therefore heavier. Water is the most common liquid to evaporate mostly because there is a lot of it just lying around (oceans, lakes, etc), but that is not the only reason. It is one of the lightest and easiest liquids to evaporate. "Density is basically how much 'stuff' is packed into a particular volume" (Amazing 9 Layer Density Tower!). So this means that if water, milk, and apple juice all have the same mass, they should evaporate the same amount, but they have different densities.

Answer: It is not about the elements but the density of the molecules that affects evaporation.

Question #3: What is in apple juice?

Information: Apple juice mainly contains water, concentrated apple juice, vitamin C, calcium citrate, and potassium phosphate. Vitamin C must get up to 80 Celsius before evaporating whereas water can evaporate at room temperature. Although, vitamin C can evaporate with the water. When you leave an apple out, it browns and dries. Well where do the juices go? They evaporate. If the pure apple juices can evaporate so can apple juice. Calcium citrate and potassium phosphate are m

Answer: The ingredients in apple juice only affect apple juice by slowing to the evaporation a bit. It mostly contains water and apple juice, so it can evaporate fairly well.

Question #4: How exactly *does* evaporation work?

Information: I know the general facts about evaporation: when a liquid get to a certain temperature (warm), it is released into the atmosphere as a gas. Some liquids take longer to evaporate than others. But why? And what does density and mass have to do with evaporation? And how does it even happen naturally? Well National Geographic says that the reason this works is the speed of the molecules. When heated sufficiently, they begin to move, vibrate, and shake quickly, behaving just as a gas would. The molecules in a solid are cold and move sluggishly if not at all. That is why you cannot pass your hand through a solid, but with a gas it is easy. Liquids are somewhere in between. Different liquids take longer to evaporate than others. Density is based off of how much mass is shoved into one portion.

Answer: The molecules in a liquid heat to the point of movement until it transitions to a gas, where it is then released into the atmosphere around us.

My Expert (Mark Westley)

Evaporation is the act of a liquid turning to a gas. In gases, the molecules are moving so fast that you can pass your hand through it, for example air. In liquids, the molecules are moving slowly. Whereas with solids not at all, which is why you cannot pass your hand through one. When heated, the molecules move faster and faster until they have turned into a gas. The warmer the temperature, the faster liquids evaporate because the molecules vibrate more and take up more space. Another aspect that can affect evaporation is density. Denser liquids take longer to evaporate. So, depending on how dense water, milk and apple juice are, they will evaporate at different rates. Yet another aspect is surface area, which will affect how quickly liquids evaporate. For example, if you had liquid in a tall, small vile (a graduated cylinder perhaps?), it would evaporate slower than a short, wide tub (for example a pond). These are things that could affect the *speed* of evaporation, but something else could be a factor as well. If the air is humid, everything will evaporate less, if at all. This is because there are already water molecules, and water-gases in the air, taking up the space. Evaporation is a topic that many may find boring, others fascinating. Whatever the case, it is topic worth studying. We will see what happens with my experiment.

Hypothesis

If I leave a cup of water, a cup of milk, and a cup of apple juice out in the sun for a week, then the water will have evaporated the most.

Materials

1. 3 beakers or liquid measuring cups as long as they have measurement in milliliters listed on the cup
2. Apple juice
3. Milk
4. Water (possibly from a faucet?)
5. A flat surface
6. Sunlight

Independent Variable: The Independent variable of this experiment is the type of liquid. The one thing I am changing is the liquids, water to apple juice to milk.

Dependent Variable: The dependent variable is the amount of liquid left at the end of the week. The amount of liquid is what changed because of the liquids used.

Controlled Variables: The constants of this experiment are the measuring cups used, the surface they are on, place they are at, the units used to measure, the amount of liquid, the amount of sunlight received, and more.

Procedure

1. Gather materials on a clear, clean workspace.
2. Materials include 3 liquid measuring cups, apple juice, water, and milk.
3. Quickly but carefully, pour 200 milliliters apple juice (milliliters and other measurement units are found on the side of the cup) into one of the measuring cups and push aside.
4. Do the same with the water and milk, for water you can use a sink or faucet.
5. When you are finished place the measuring cups in a spot where they will not be touched and will each get the same amount of sunlight each.
6. Check the measurements of the liquids every 24 hours starting now. Try to be exact.
7. After 8 days, find the final measurements of the water, milk, and apple juice.
8. Compare.

Data

Day	Water (mL)	Milk	Apple Juice
Day 1	200	200	200
Day 2	>200	>200	>200
Day 3	>200	>200	177
Day 4	172	<175	167
Day 5	161	165	162
Day 6	149	155	152
Day 7	133	150	147
Day 8	118	135	120

Conclusion

My hypothesis was that if I left 200 milliliters of water, milk, and apple juice out for eight days then the water will evaporate the quickest. It was correct, but barely. At first the apple juice was evaporating quicker, with 167 ml left, and 172 ml left for water, but by the eighth day, water took the lead again. With 118 ml for water, 135 for milk, and 120 left for apple juice, it was determined that water evaporates the fastest out of milk and apple juice. After conducting and researching on this experiment, I have found information about evaporation that I hadn't known before. The reason water evaporates fastest is because it is the lightest liquid-or in scientific terms, the least dense. Water is runny, milk is more dense. Apple juice is somewhere in between. The liquid in the milk was able to evaporate, but it left the heavy stuff behind. Also, some of the "heavy stuff" (which could include fat and other ingredients) was evaporated with the light liquids, which weighed them down, making it take longer to evaporate. With the apple juice, it has a lot of water, but all of the other ingredients in it weighed it down so that water was able to evaporate faster. Water of course sustains hydrogen and oxygen which is very light and easy to evaporate. Nothing is best left unknown, and while the rest of the world may have known this already, I can know safely say, that if you were to leave 200 milliliters of water, milk, and apple juice out for eight days, water would evaporate quickest.